

for expiration, approximately room air is present. Obviously, if the rate of oxygen flow is only 2 litres a minute and the subject has a minute-volume of 8 litres, room air will be drawn in also and will dilute the 2 litres of 100% oxygen, giving an inspired atmosphere of 40% oxygen.

Since the volume of the mask is so small, and its walls are semi-rigid, a dead space is not built up, all the air inside the mask being in a constant state of organized movement. The pattern of this movement is dominated by the fact that the end of the gas-delivery tube reaches up to the plane of the rim of the semi-rigid member and thereby delivers the gas to the immediate site of inhalation.

The mask was tested for the oxygen and carbon dioxide concentrations inside it.

Results

Values for carbon dioxide were less than 1% in all samples, and with prolonged wearing there was no further accumulation and no rebreathing occurred. Tests for oxygen concentration at the patient's mouth were carried out on 21 different wearers and with flow rates of oxygen from the cylinder of 2 litres a minute and 4 litres a minute. Analyses were made by a Beckman oxygen analyser. The results obtained showed that when the oxygen was leaving the cylinder at 2 litres a minute the average concentration at the patient's mouth was 35%. When the oxygen was leaving the cylinder at 4 litres a minute the average concentration at the patient's mouth was 48%.

Alveolar samples were analysed in the same way when the rate of flow of oxygen was 4 litres a minute. The results are as follows:

Time of Administration	Oxygen in Alveolar Sample
5 minutes	28%
10 "	30%
15 "	34%
30 "	35%

Summary and Conclusions

A new mask for delivering oxygen or other gases is described in which there is a valve effect within the mask though no mechanical valve is present. The inflowing gas forms a cone of high concentration, and the expired gas is blown outside this cone to the periphery of the mask.

There is no measurable rise in carbon-dioxide concentration with a flow of 2 litres of gas a minute, because the small volume of the mask prevents the formation of a dead space and therefore prevents rebreathing. The shape of the mask and the position of the end of the gas-delivery tube ensure that there is a continuous and organized movement of the gases inside the mask.

The effective delivery of oxygen to the patient at low flow rates is important, especially in domiciliary practice where economy of oxygen is essential. It is generally agreed that an oxygen concentration of 30-40% in the inspired air will fully saturate the arterial blood in most cases. The results obtained with the M.C. mask show that its size and design enable such an oxygen concentration to be delivered to most patients with a flow of oxygen from the cylinder of 2 litres a minute.

A patent application for this mask has been filed and the rights are being assigned to the National Research Development Corporation, to whom inquiries should be addressed.

My thanks are due to Mr. Michael Snow for his great help in taking the gas samples and analysing them. I also thank Miss Mary Brown for the diagram.

REFERENCE

Catterall, M., and Snow, M. (1960). *Brit. med. J.*, 1, 1254.

Medical Memoranda

"Vacuum Cleaner Injury" of the Penis

Many forms of penile injury have been described after attempts to induce erotic stimulation. Strangulation by rubber bands, metal rings, and string are the commonest, producing oedema and sometimes even retention of urine and gangrene. Three patients with similar penile injuries produced by a vacuum cleaner are here described.

CASE HISTORIES

Case 1.—A widower aged 57 attended hospital on October 17, 1957, because of penile lacerations. He had been greatly incapacitated for a number of years with chronic bronchitis and emphysema. Returning from having a few drinks in a public-house and seeking erotic satisfaction, he introduced his penis into the end of a vacuum cleaner tube and switched on the machine. However, pain soon caused him to stop, and then he found his penis was congested and bleeding. On examination the glans penis was extensively lacerated, the lacerations appearing almost "explosive" in nature. The urethra was not involved. The lacerations were sutured with catgut, and a soft rubber catheter was introduced for several days. Recovery was uneventful.

Case 2.—A 28-year-old bachelor attended hospital on September 11, 1957, with similar extensive lacerations of the glans penis extending into the external urethral meatus. The prepuce was also lacerated. He had produced the injuries in exactly the same manner as the previous patient. Circumcision was performed, the lacerations of the glans were sutured with catgut, and a self-retaining urethral catheter was introduced. Healing was satisfactory without any sign of stricture.

Case 3.—A widower aged 75 attended hospital on August 7, 1959, in great mental distress and complaining of pain, swelling, and laceration of the penis. He stated that while cleaning the stairs his penis had accidentally slipped into the end of a Hoover "dustette" vacuum cleaner. However he then attempted to obtain erotic stimulation by switching the motor on and off. On examination two irregular circumferential lacerations were present in the prepuce, each about 1.5 cm. long, and there was a similar laceration on the dorsum of the glans penis. The glans and prepuce were oedematous. Micturition was normal. The lacerations were not extensive enough to warrant suture or circumcision, and healed satisfactorily in two weeks.

COMMENT

The method of masturbation used by these patients was rather ingenious but had disastrous results. They attempted to simulate an active sexual partner by introducing the penis into the tube of a vacuum cleaner and switching on (and in one case on and off) the suction power of the machine.

No similar case has been found in the literature.

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